Fort Myers Notebook, N-86-08-17

This notebook covers the periods April 1886 and May 1887. There are also a few undated entries in between. All of the entries are by Edison. Many of them deal with the rotation of the earth and other planets around the sun and the resulting lines of magnetic force and electricity, which, Edison theorized, were responsible for gravity. There are also numerous entries relating to spectroscopy and to fundamental experiments on magnetic fields. Other notes and drawings concern the grasshopper telegraph, electric meters, arc lights, electric power distribution, pressure indicators, armature design, telephones, and the direct conversion of heat into electricity. Included also are notes about experiments to be performed at the new laboratory in Edison's lamp factory (see Lamp Factory Notebooks). One unlabeled set of drawings may pertain to ore separation. The first page contains the notation: "Fort Myers Florida Aug 17 1886 Ideas T A Edison." The book contains 288 numbered pages.

Blank pages not filmed: 128-129, 136-137, 142-143, 286-287.

Missing page numbers: 95-96, 103-122.

N-86-08-17

No 40967
ARTHUR & BONNELL
MANUFACTURERS
55 CEDAR STREET
New York

Fort Myers Florida

Aug 17 1886

Ideas

TA Edison

April 18 1886 TAE

The rotation of the earth around the sun (which is an immense magnet or spherical mass with polarity one ½ N other half S Throwing out lines of force through space) cuts these lines of force so one side of the earth is N the other S but this does not produce a current but the rotation of the earth on its axis causes the circulation of a tremendious current around the earth in direction and parallell with the Equator clear up to the two poles which it creates, The mutual attraction of the lines of force of the Earth with its poles and the lines of force of the sun is at the present distance of the Earth from the sun just sufficient to balance the tendency of the earth to go in a straight line, hence its orbit. - The lines of force emminating from the sun are eleptic as produced by the counter lines of force from bodies outside of our planetary system, hence the Earth to always be in an exact balance between its tendency to proceed in a straight line & the attraction of the sun must move in this eleptic orbit -

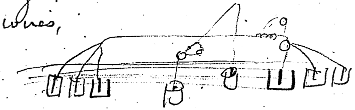
The rotation of the earth or rather oscillation of the earth to produce The seasons must be due to the fact that the sun oscillates.

In the same manner —

Expmt

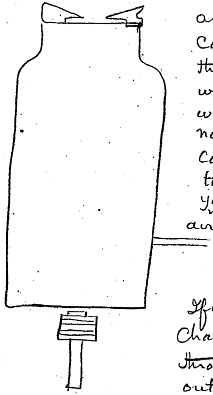
To ascertain the strength of Electric polarizatn of matter on the earth subject to conduction & in Current form Take two wires each 500 feet mile long one east & west the other north and South, No 0000. Sink a several large porous pot at each end in good damp earth fill with Solution of Sulphate zinc & use amalgmated Electrode zinc for ground plate —

Measure daily morning noon & night Current & Volts on both wires,



April 18 1886 TAE

Grasshopper



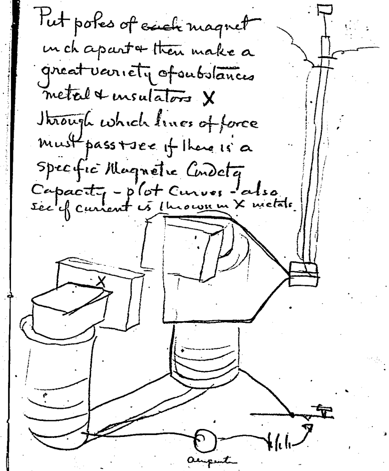
ascertain if by Compression of air the Column of air which is in Tune with a certain note can by increased Compression respond to higher note (ie) as you compress the Column may be shorter

If Above correct Changes in Barometer throws Resonators out of order - ditto velocity of sound in air -

April 18 1886 TAE

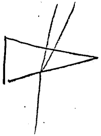
Fundamental Magnetic Experiment

Put poles of ~~each~~ magnet inch apart & then make a great variety of substances metal & insulators X through which lines of force must pass & see if there is a specific Magnetic Condctg Capacity - plot Curves - also see if current is thrown in X metals



April 18 1886

X4Z

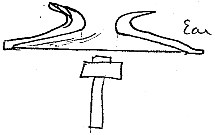


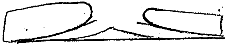
Spectrum – pass tubes filled with liquids also wires – paralell & at right angles to the beam of light. pass a beam of one kind of light through a tube lengthwise & move this paralell & at right angles to another beam of different Colored light & also the spectrum & also white light – Try these Expmts also in magnetic field both directions –

April 18 1886 TAE

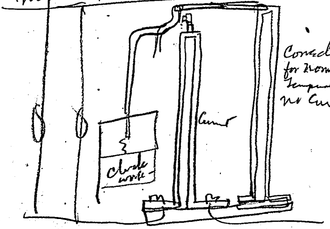
Make a jumpspark spectrum also
flame spectrum of iron nickel
and other metals & then
The same in a powerful field
parallell & at right angles to
the L of F also in a partial
Vac tube & thus between poles
in various directions of a
powerful magnet, also use
static from holz to change it in
Vacuum,

April 18 1886 TAE

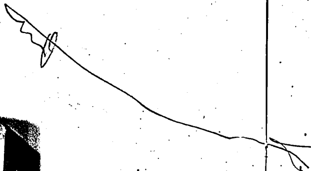



Trans mouthpiece

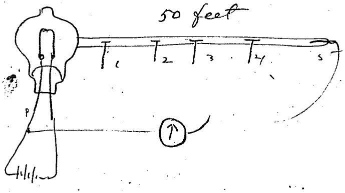
Meter by Electric heat Expansion


Correction for Normal Temperature no Current
Current
Clock work

also put secondary coil
around X + see if
beam light - through Alum
gives Electric wave in
Mirror gal — also heat

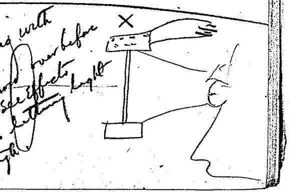


April 18 1886 TAE



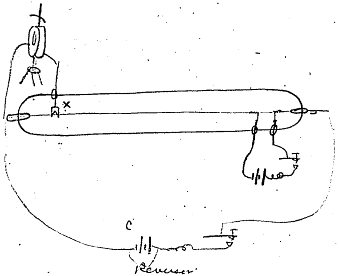
See if it will conduct in
straight line + get Res
every 10 feet —

Place glass
Coated in Vacuo with
iron + ozokerite
wax melted + flowed over before
Vac broken — See Effects
magnets putting Light
through



April 18

Expt



Experiment to determine if heat conducted along a wire is hastened and retarded by Electric Currents to & fro. part of the wire is kept incandescent until ~~by~~ Conduction heat reaches the thermo metal X when mirror Gal detects; Conduction time 1st ascertained with C off Then with Current P & then N from C also vary strength,

April 18 1886 -

Fundamental -

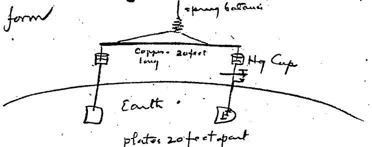
Theory that gravitation is due to the circulation of an electric current around the earth due to the rotation of the earth on its axis cutting the lines of force thrown out into space by the sun which is a magnet whose pole in center line is parallell with that of our earth - The Current circulat around the Earth paralell with the Equatorial Belt clear to both poles (ie) like the lines of latitude

The weight of all matter diminishes (ie) Electric attraction diminishes until we reach the center of the earth - matter insulated from the conducting Crust of the earth is attracted by socalled static attraction, hence the weight of such matter should diminish as we recede from the earth a pound of Glass weighed by a spring balance

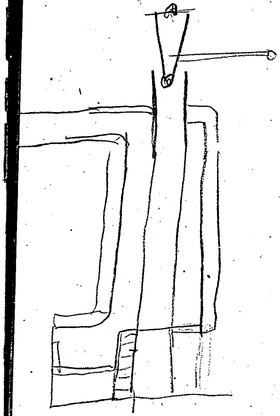
Make a filament about same as regular lamp but straight + 10 inches long 1/2 dia — wind fine wire around outside primary + secondary — Then heat fil with Current, bal wi side of bridge the wire + use another tube same amount of wire on same size tube so as to get same self induction — Now when Iron white bal — then gradually lower temp by res in circuit + take throw of gal each time — afterwards put Iron one side Nickel other + get Curves —

and the sea level showed weigh less on the same balance in a Baloon 5 miles high.

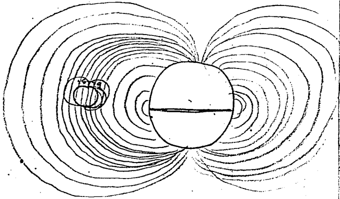
Here is an Experiment to determine if matter where the E has a current form is attracted greater than in static form



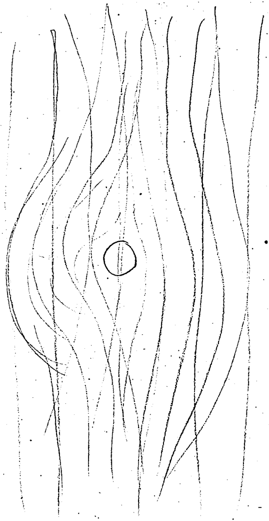
Test in New Lab —
Consider availability of Cobalt Nickel + Iron for heat Effecting magnetism



April 18 1886

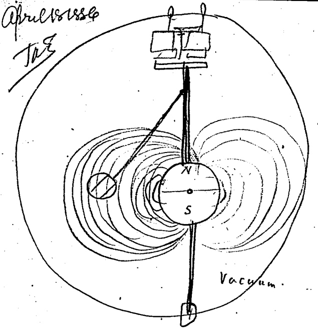


The reason why the earth rotates on its axis while going around the Sun is be cause the lines of force cutting the earth on its face nearest the Sun are the strongest gradually weakening as you go farther out from the Sun The weakening of the line in 8000 miles is sufficient to produce rotation by mutual attraction between the strongest earth lines and the strongest sun lines.



April 18 1886

TAE



apparatus to prove the theory

April 21 1886 -

Perhaps our solar system is rotating as a whole and the sun rotating cuts its own LF & Thus the heat is accounted for -

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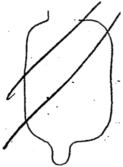
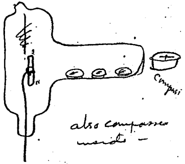
Fundamental





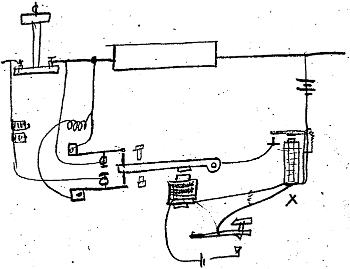
also compasses inside -

ascertain the strength of deflection in a Compass needle 12 inches away. fr a small 1/2 size telephone perm may then proceed to Exhaust air & see if lines of force spread out in vacuo watching for nece deflection of needle as Exhaustion proceeds

April 21 1886 TAE

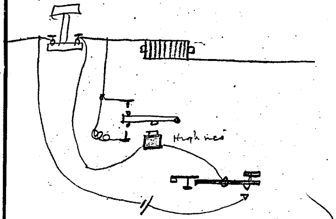
Phonoplex

To Silence phone when Sending + also save battery



X has Copper Core around iron core.
Cop $\frac{1}{16}$ thick act very sluggish

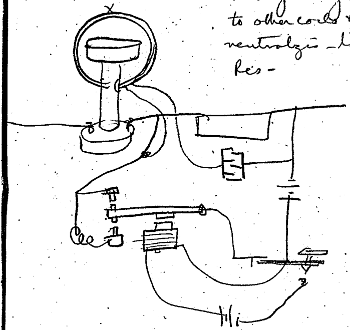
April 21 1886 TAE



not good

April 21 1886

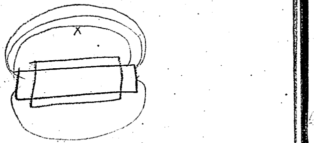
Phonoplex



X Right angles
to other coils &
neutralize - low
Res -

April 21 1886

Fundamental.

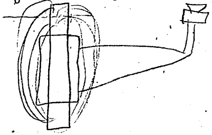


How are LofF conducted, can it be that
the actual iron molecule goes round via
x put in path of lines of force
a gas flame to oxidize it and a
wetsheet of Ferri also ferrid potassium
also look through Spectroscope
at Bunsen burner through which
LofF pass see if get iron spectrum

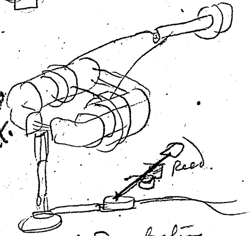
April 21 1886 -

X42

Vibrate a flame in path of L of force
see if it effects it & give sound in telephone



also galvanometer



Dec 10 87
ordered made
by John Ott.

Reed vibrating
diaphragm gives
vibration to chamber thro
which gas passes thro to flame in front of L of F

April 21 1886 –

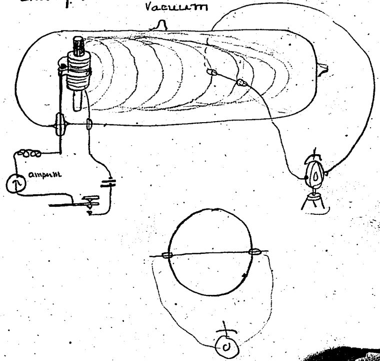
Fundamental.

As Iron gives a jerk when heated by Elec at about red heat and Expands & Contracts & also loses its magnetism or power to become magnetic about same point & I think reverses direction of Current in Thermos at about same point (ascertain). [illegible] other metals dont, This shows that its molecules or atoms are closer together than other metals, + ~~therefore~~ and have to be separated by heat before they become like the other Conductors not so subject to magnetism, hence a slight Electric Current in Iron makes powerful attraction & scarcely none in other metals, Perhaps Certain Metals if cooled down to 75 or 100 below Zero & put in a powerful coil would show magnetism

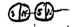
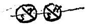
Use rotating disk & Solid Carbonic acid & ether.

April 23 1886 TAE

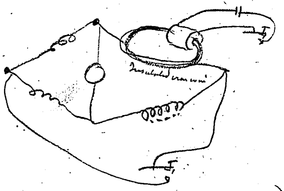
Vacuum - Run curve of E.M.F. as exhaustion proceeds - also work beam of light both directions - heat tube and run curve, also statically charge.



April 22 1886 -

It is probable that an electric Current cannot get the atoms of non magnetic metals completely rotated so N & S are Exactly opposite Each other, They rotate with difficulty while the iron atoms rotate easily and when a piece of iron is saturated ~~the~~ atoms are all opposite in ~~op~~ polarity (ie) 
in Copper even by current heated to the melting point they are only partially rotated 
The Effect of heat must be to rotate the atoms in the opposite direction as at red heat magnetism is lost, while Electric Conduction which can only take place by rotation is diminished by heat,

Independent now the question is does iron become a better conductor of E if magnetised Try

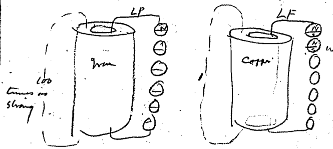


measure it magnetised + demagnetised) —

If not then as iron outside of its magnetic property acts to a Electric Current like another metal then iron must be have a Compound atomic arrangement one system of atoms rotating Easily gives its magnetism while the regular atomic system but air is polarized by them & cant show it

Causes it to act like another metal to E.

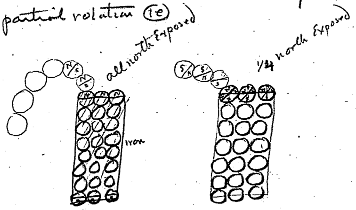
I must carefully investigate all the phenomena connected with the sudden jerk in red hot iron noticed by Barrett, see if it does it without current but by heat along without Electricity.



It may be iron has no magnetic polarization as air hence it shows no magnetism perhaps all metals are magnetic

Hence the air seems conduct lines of force ~~from~~ Iron several hundred times better than ~~the~~ same lines of force from Copper etc

This would seem to show that there was Either a surface polarization of the Copper or the End atoms on Iron were rotated Exactly north & south with a given ~~[illegible]~~ Current while with other metals there was only partial rotation (1e)



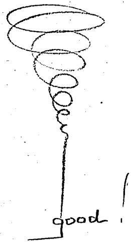
If rotation of Copper atom was $\frac{1}{100}$ part of that of iron atom with given Current The polar pull or attraction at the Ends of Copper would be only $\frac{1}{100}$ part of that of Iron ~~when Iro~~ because. The total surface of active atom surface would only

be $\frac{1}{100}$ — Iron very probably
is fully rotated when saturated,

If conduction is rapid occillation of
atoms (from the great earth pole line
or internal attraction due to earth
cutting lines of force from the sun)
Then the amplitude is due to the
ampere, and rapidity to the number.
hence a one ampere cell will give
a current which will give a certain
amplitude of axial rotation say 100 M
in second, 2 cells added together +
still same current + twice resistance
will give ~~same amp~~ ~~the~~ same amplitude
~~But~~ twice the ~~number~~ (ie) 200 M
in the whole length
or what is probably more correct
^ keep up the same amplitude in the
first ohm The increased pressure
preventing a fall of amplitude
~~in the first ohm by the addition
of the second ohm~~

April 22 1886 TAE

If steel is a definate combination of carbon and iron, then when cast iron is molten, it should decompose with a strong current say 1000 amperes per 3 square inch section.



good!

April 22 1886 TAE

Determine by the 39 inch pendulum experiment apparatus if the saturation curve in amperes is the same when the poles are far apart or close together

340

30

	Distances from Sun Earth being unit	Period in days	Eccentricity	Inclination of orbit.	Diameter miles
Sun					888,000
Mercury	·3871	87.	·2056	7° 6'	3089
Venus	·7233	224	·0068	3 24	7896?
Earth	1,000	365	·0168		7896?
Mars	1·5257	686	·0933	1, 51	4070
Jupiter	5·2028	4332	·0482	1 19	92,164
Saturn	9·548	10759	·0560	2, 29	75·070
Uranus	19·1824	30686	·0466	0. 46	36,216
Neptune	30·0363	60126	·0087	1, 47	33 610.

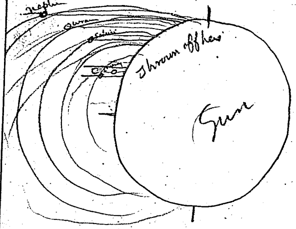
Dia Moon 2153

Inclination orbit 5° 9' ?

Distance in radii from Earth 59.9.644

Sideral period 27d 7h

Synodic Revolution 29. 12h



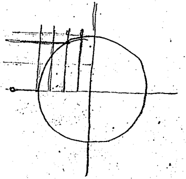
		bulk larger
Saturn	3 times slower	90
mercury	.1 faster	21 "
mars	.26 slower	18 "
Uranus	4.46 slower	
Neptune	5.46 slower	

Saturn 99 times weaker Lines of F
90.56 Larger in Bulk
9.5 greater dia
9.5 " distance around orbit

29.4 longer going round this orbit
or 3 times slower than the earth. per mile

Mercury
Lines of F 4 times stronger
4 times nearer
4 times less length of orbit
4.1 less time going around orbit
2.5 less diameter
6.54 less bulk

Mars Lines of F 2.25 weaker
1.52 the distance
1.94 " diameter
1 62 longer orbit
1 58 times longer going around
3.7 the bulk



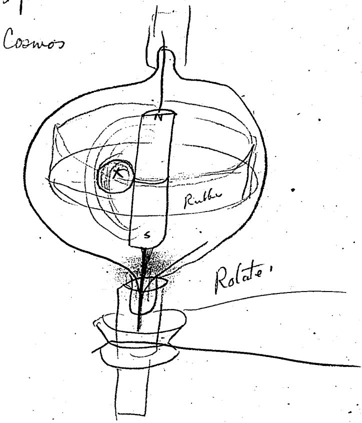
Uranus
Lines of Force 360 times weaker
84 times slower making the orbit
19 " greater length of orbit
or 4.46 slower per mile
21.036 times greater bulk
4.54 times the diameter

Neptune L.F. 909 times weaker.

18.11 times the bulk
30 times the length of orbit
5.46 times longer going a mile
4.25 times the diameter

April 25 1886 TAE —

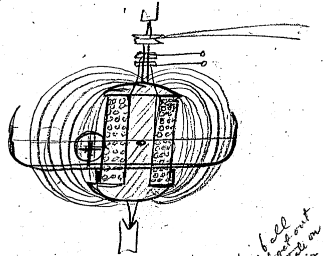
Cosmos

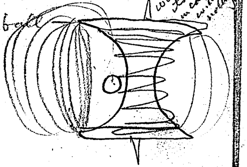

N
X
Rubber
S
Rotate

X Copper Ball.

April 25 - 1886 TAE

Cosmos




X Copper ball

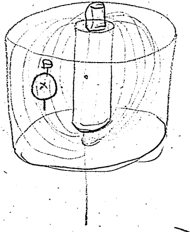
This ball Cant get out will rotate on its axis in contact with nothing

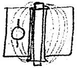
April 25 1886

TAE

Cosmos.

Try variety Expmts with this



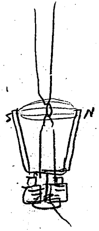


Copper just balanced in Kerosene magnet ~~rotated~~ see if rotation on its axis — also rotate the jar & hold magnet still, April 25 1886 TAE -

Make a lot of hollow balls 1/2 inch
dia of Iron Lead Tin Zinc.
& other metals, balanced exactly
by themselves in Benzine also
water with salt in - Then
Throw in an Iron ball & several
Copper see if they arrange themselves
differently - also Cut water
with lines of force, pass
Current through with variety
balls in liquids - see if
any definiteness comes of
it,

April 25 1886 -

New dodge
arc Lights



Rotate the arc
& Keep it in
Center stops
flickering -

Good work it up

Notes for Lamp Expmts — June 18 1886
TAE

Ammonium Nitrite present in the breath, in large quantities after eating especially — J Chem S Vol 25 — p 35

Rain water 2 milgm per Litre Nitric acid + ammonium Nitrite

Absptn Cocoanut charcoal see J Chem Soc March 1870 — also Vol 25 — p 649 latter gives table of absptn Cyanogen + NH at dif temp press 760 mm

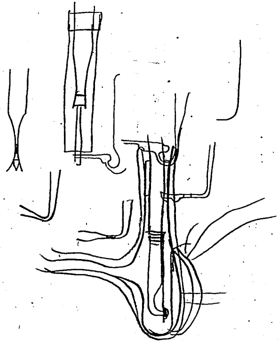
Nitrous oxide decomp by Copper Spiral also iron —

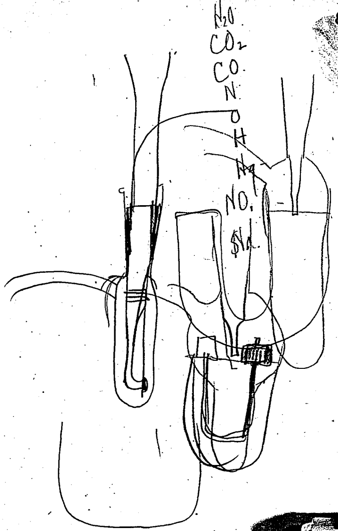
Silver Reduced from Oxide by Hydrogen in Lamp absorbs mercury

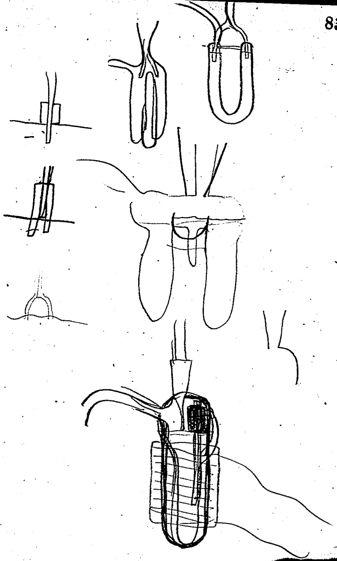
Try Potassium amalgam —

Try Lead Reduced by H, for absorbg O hot —

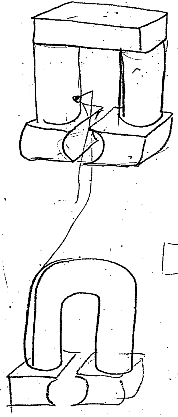
Alcohol cleans glass
splendid—
other cleaners Bisulphide Carbon
Cynide potassium, Benzine,
Nitric acid— alkali hot,
Heat— This leaves porous
residue charcoal & salts,
hence better use alcohol removing
it, first hot water, then Alcohol,




H_2O
CO_2
CO
N
O
H
Hg
NO
SNa



175 —



4000,

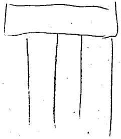
16100

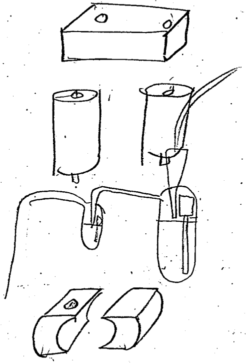
1

5

3.7/8 —

$2\frac{1}{4}$ —





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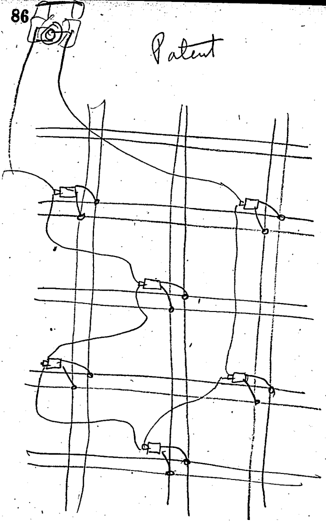

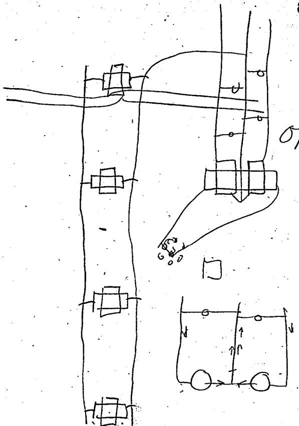

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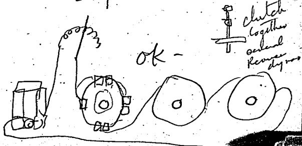
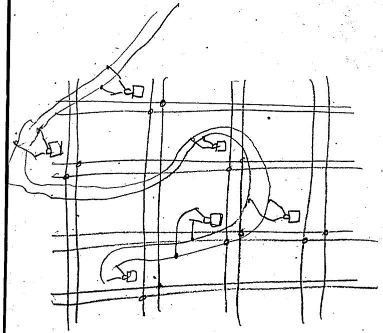


OK -

clutch together several Reverse dynamos



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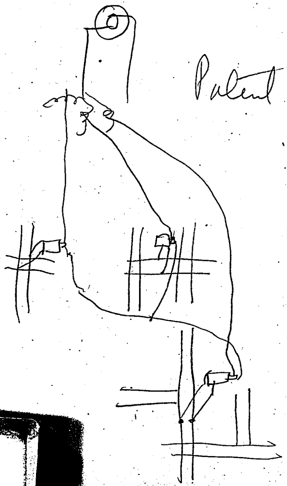

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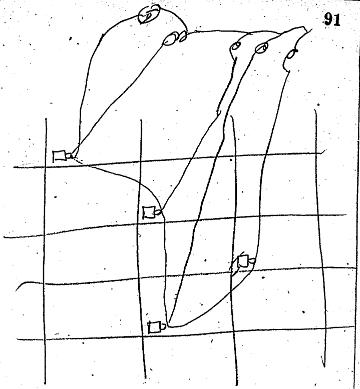

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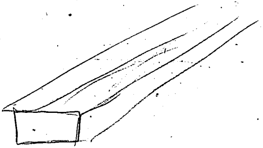
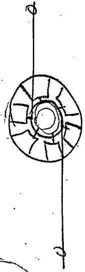
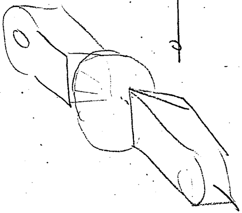
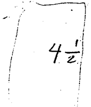






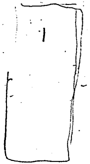
6

12
16
28



28)1000(35
84
160
168

1

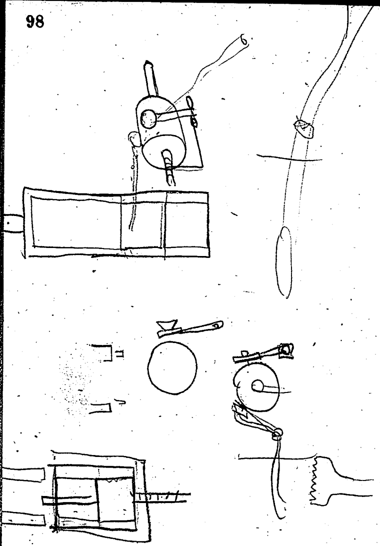


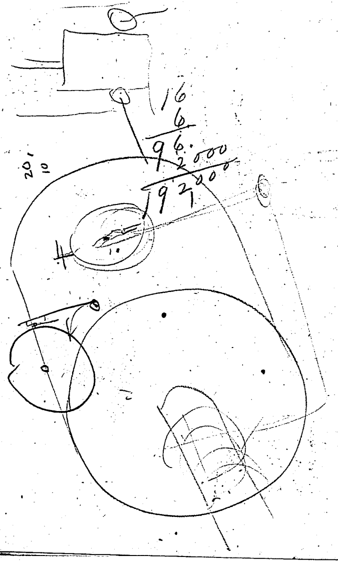
1.2
90
1080

2000

35
70

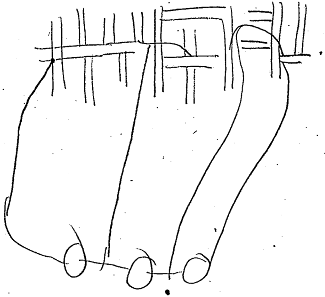
19.200



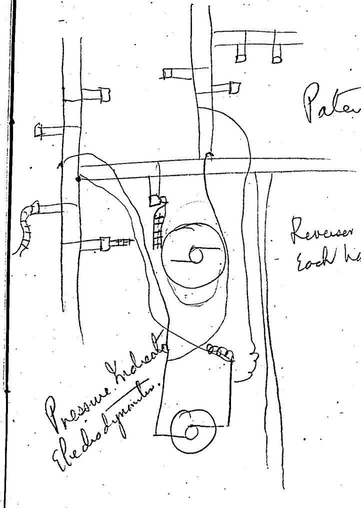


16
6
96.000
2000
192000

20
10

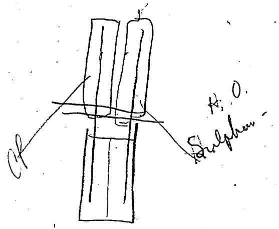


1000, 2000,

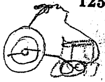

Pressure Indicator
Electrodynamometer.

Patent

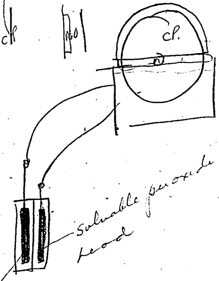
Reverser in
Each house

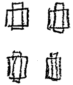

Cl
H, O.
Sulphur -

25
15
30.
o
50,



H, Cl

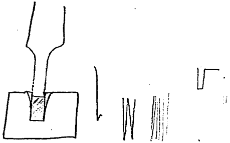

Cl.
Soluable peroxide
Lead

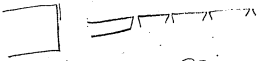


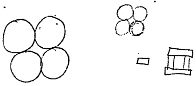
772 30000
231,60000

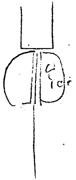
11-
22 hp 1 hour Reduced lead
2 lb H_2 016 lbs O.

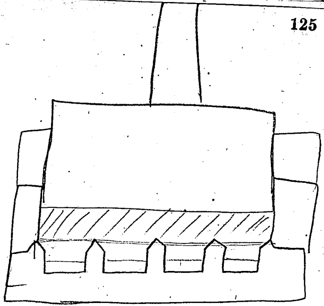
SO_4

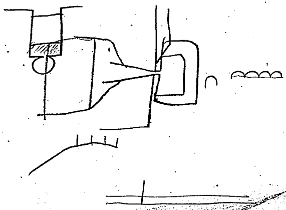


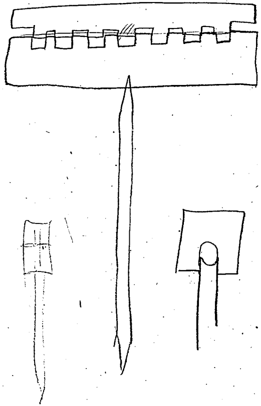


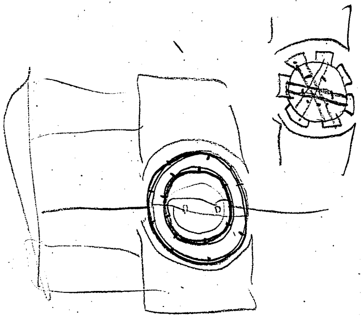


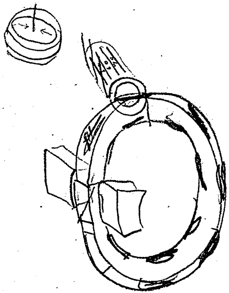












350
80
28000

350
36
2100
1050
12600

Vails Lamp-

~~Surface~~ Content - 8x10   80. 3.50 long.   280. cm
Surface.   36   1260.

50 Volts, 70 ohms res, 16cp-

New lamp: '
Content.   50.———   10,0 ohm   260
Surface, ——5.2 inch long   1248
6/1000. Content 28   ~~4~~ long—   ~~1966~~
Surface   7 long   1260

50:

280
70
19600.

196) 39200 (200
392

28 50 | 108. (
92
56
252
257.6

2401

52
50
2600

18

196
39200

28
60
1680

36
78
288
252
2808

36
5) 240.
48

28 | 108 (4
112

28
8
164

28
9
252.

8. 196 78
64
312
468
4992

67
52
1.4

120
48

280.
5.2

180
90
1260

28
7
196.

24
55
120
1200
250
1250

18.
92
36
162
1456

24.
350
1200
72
8640

3.

24.
50
1200

24
53
72
1202

240
5.

24
52
48
120
1248

120 441.

368
120
7360
736
368
44160
722
584
1340
1176
1640
196
3.68

8

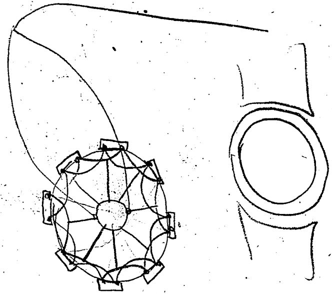
1350
8
10800

722. Content
2835. Surface
Reo 120 ahu

107
675
535
749
642
72225

120
260
9600
2400
33600

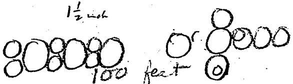
42
675 260
42
1350
1300
2700
28350
722
520
2020
2080
2.8



100 000001·

1

$1\frac{1}{2}$ inch



100 feet

001

10 .0001 $H_2O.SO_3$

1

14 00001

135 000001

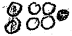
12 0000001

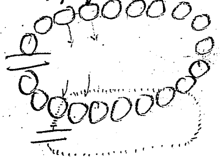
$1\frac{1}{2}$ 00000001

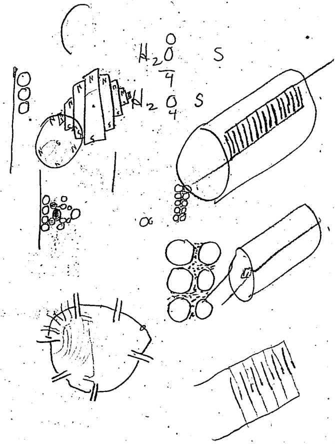
$\frac{1}{14}$ of a cm 000000001

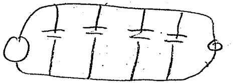
H_2O

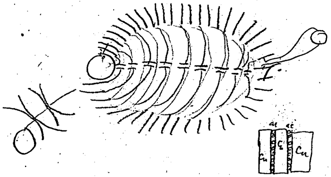
H_2



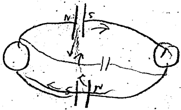


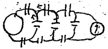

H_2O
O
4
S
N_2O_4
S
N
S
N
S

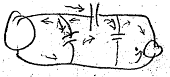


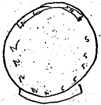

al
al
E
Cu
Cu

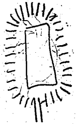
O R O R O R

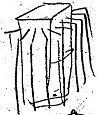

N
S
S
N

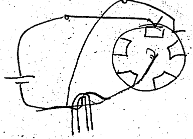


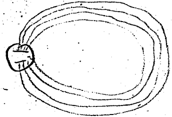


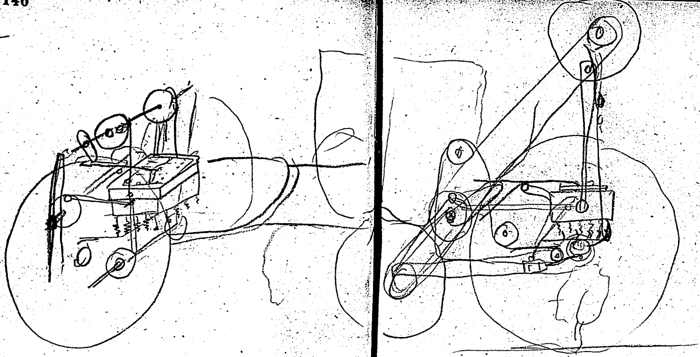

N
S

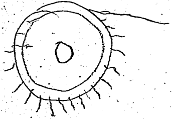


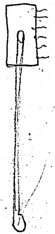


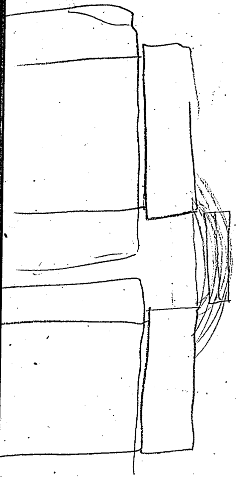


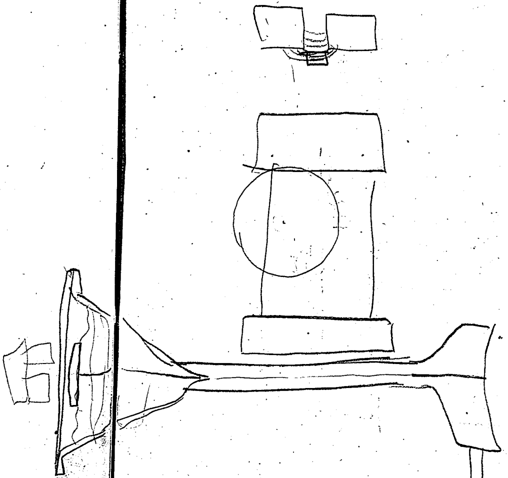






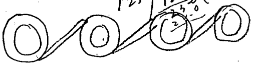


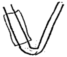




200

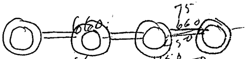
125)1500(12.
125
250
250

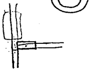




.75)500(606
450
500

75
660
375 0
4950
4950





66
13
198
66
858

4

80
20
1600.

1000.

100.

Boiler 10. $25 } $50.
Engine. 15.

5 lbs Coal per hp. 1 cent per hour -
Labor.

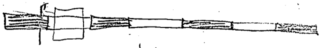
500 ampere Dynamo - $2000.

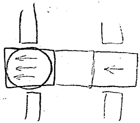
20 500 Amp - $40.000

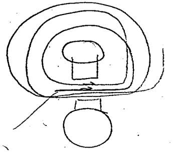
66 hp each Electrical
87 percent net:
8½ hp extra 66.0
8.5
74.5
50
$3725.0

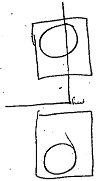
3725.00 for boiler & Engine. - $74500.
20
74500

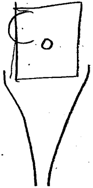
Cost, 24 hp -

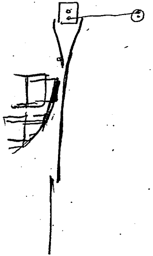


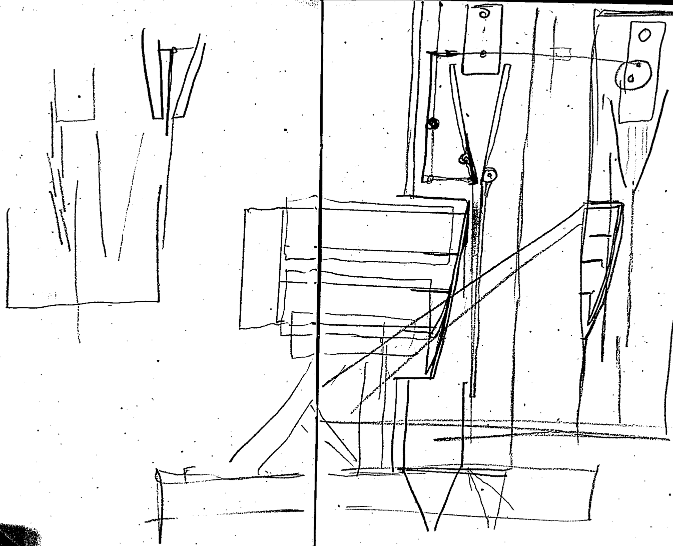


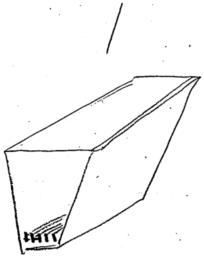


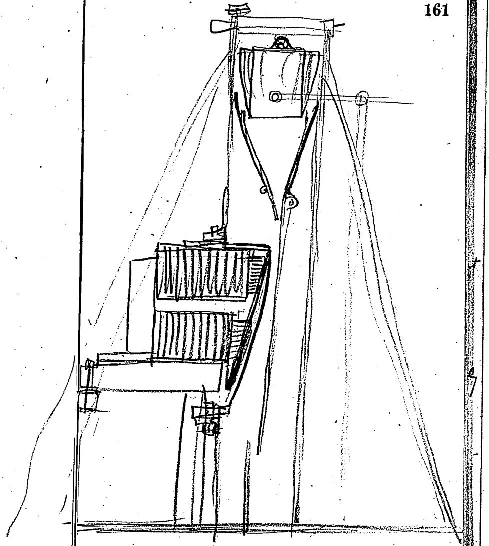

heat

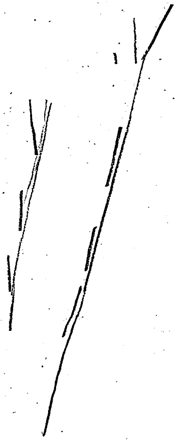


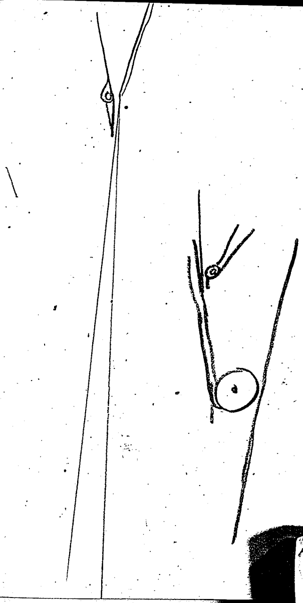


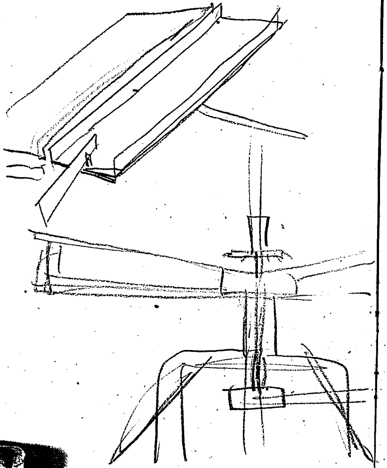


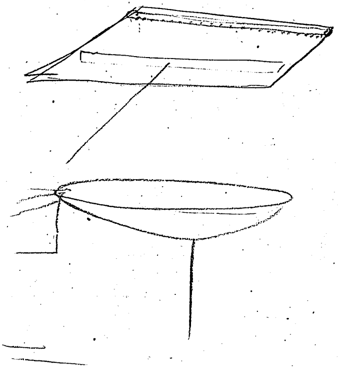


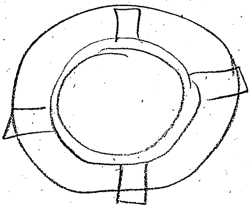


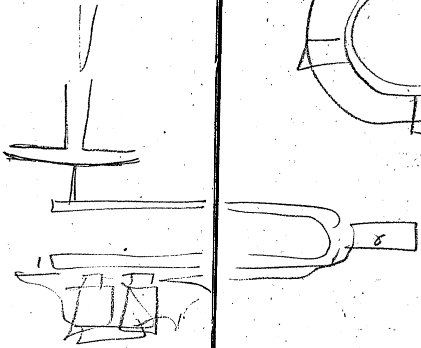








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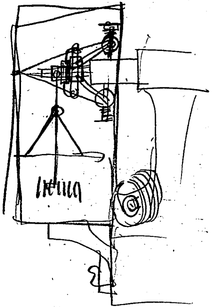

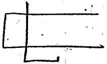

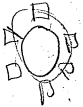

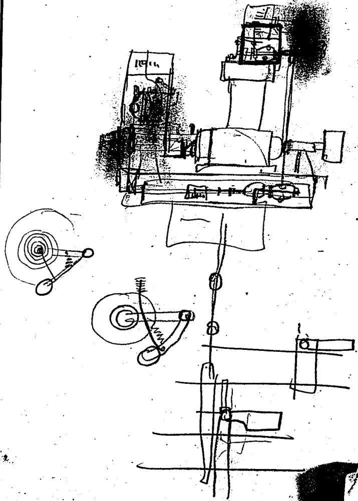

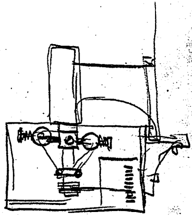

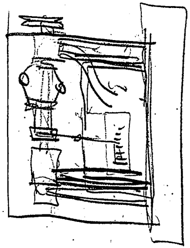

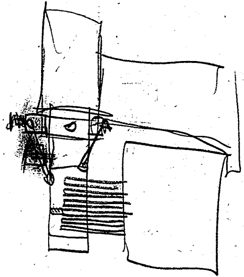

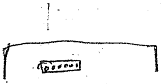

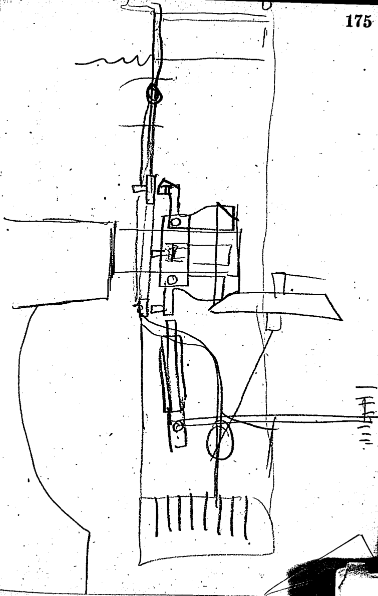

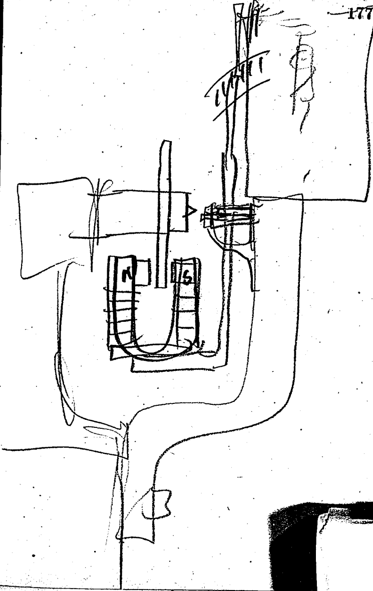
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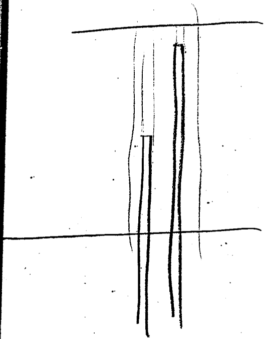
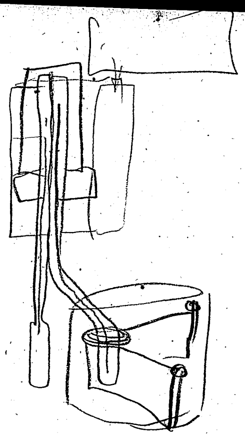
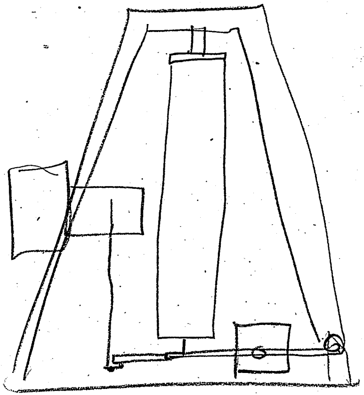
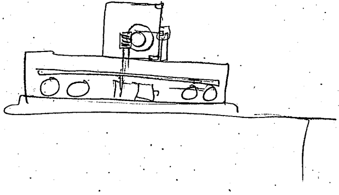
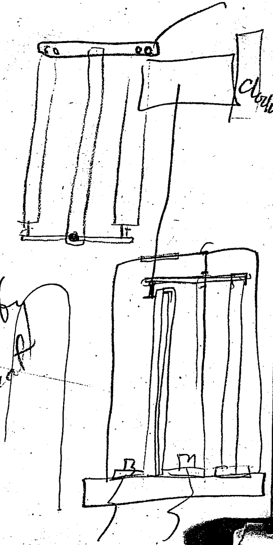










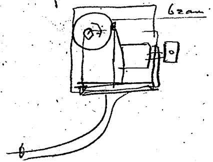
Meter by
Electric heat

Expense

Experiments New Laboratory —

Kinney phono motor Emg relay on top for repeating WU Tel —

Probable surface of chalk effected by light - use diaphragm with mirror & heliostat, & condensing reflector or ~~ff~~ Lenses make very narrow streak light, talk & turn Emg - if beam alters Capilarity for instant talking to be heard probably its only for instant like Electricity.



if wks put in Alum Cell stop all heat & try light — then try Ultra Violet or actinic rays only —

Expts New Laboratory

Light Effects chlorine +H — close a tube with Rubber diaphragm with hearing tube & chlorine & H in proportion to form HCl — with or without Water to absorb HCl which it does explosively — perhaps saturated Cl Water & free Cl with H ok — let beam light End on Entire tube — vibrated from Mirror on diaphragm — heliostat & Sun light —

Ozone apparatus Silent discharge for forming synthetically subs on Commercial scale with Rev current mac or high volt dynamos & Silent discharge tube — Multiple arc

800 Lamps 1 mile 12000
1600 24000
96,000
1600 2 miles 1265.

1265
300
1565

100 1.40
200 70.
400 35
800 17 2

$3000.
$12,000.

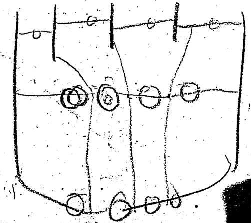
33750 75
16875 0
3375 0
5062
12656
4 | 1

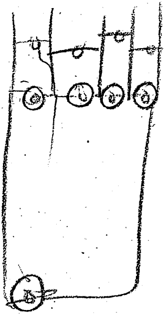
10
5
15
25
40.
6.
10.
3

800 × 800 − 4 · 24000
400×4×4×41.

16) 96000 (6000
96

200
6000





Electric Lamp Experiments

May 1 1887
TAE

Martin

Dissolve or rather mix as much pure Alumina & ~~in another solution~~ also Magnesia ~~Zirconia oxide~~ with asphalt Solution possible - dip preliminary Keep in A Carbon & also Carbon in Solution, so surface when Carbonized will be partially of ~~as a~~ non conducting ~~infusible~~ oxide
make a order number | 15 going to clamp dept

No 2

~~In Sugar Solution dissolving as much lime as it will take up & dip filaments~~ - ~~also~~ make a strong acetate of Magnesia - lime Alumina etc Solution nearly saturated & syrupy ~~[illegible]~~ then dissolve all the Sugar it will take up & in this solution dip preliminary filaments & also carbons on Carbonization: this will give a Carbon - Magnesian Surface - make 15 of each kind

Martin

Electric Lamp Expts Contd

May 1 1884
TAE

Pack some new stock filaments in powdered asphalt & run up to as high as possible say 600 fahr take out while hot & pour it out getting filaments out & dissolving off asphalt - then dip in regular asphalt solution & repreliminarys also Linseed oil - Ext Hamilton also Linseed oil Loaded with asphalt.

Dip preliminarized fibres prelim to 500 @ 600 in melted asphalt ~~[illegible]~~ at 600 @ 700 fahr - Try melted sugar

Arrange to duplicate 234 in our new process but putting filaments under strain -

Duplicate a good new stock Carbon instead curve but using of metal boxes - Martin

Run some new stocks, through with powdered fusible metal securing filaments so they wont float, when metal melts, Hamilton

⊗ put a pine stick in metal tube which stick has been soaked in saturated solution Tannic acid put some tannic acid in bottom bring up quickly in stove of pump room

gota dett

Tri bromide Bismuth
melts 198 boils at red heat

Fusible metal
4 Bi — 1 Cadmium - 2 Lead 1 tin -
~~7 or 8 Bi 1 or 2 Cd 4 Lead [illegible]~~
4 Bi - 1 Cd 2 Pb 1 Sn -

antimony trichloride
melts 73. boils 230 at
pressure atmos & 160 in
vac -

Stannous chl melts 249 -
boils 617.

Lamp Expts —

May 1 1887
TAE

also put pure stick in tube with
Red oxide Mercury in bottom
to give off oxygen — John Ott

preliminary fibres in following
Liquids as high as possible —
Melted Rosin — Anthracene,
Chrysene — mp 275 C Hexabrombenzine
mp 300 C Hexachlorethane,
~~[illegible]~~ C_2Cl_6 - mp 182 C The
~~Chlorine~~ Haloids may produce beneficial
Chemical reaction Hexachlorbenzine.
mp - 222 C Try flour Sulphur
to preliminize in — melts 113 C boils
447 C

Lamp Expts —

May 1 1887.

TAE

Preliminary in glycerine, olive oil, Sugar alone — powdered gum — phenol

187c boiling pt,

Boil some fully Carbonized filaments secured in reg form in Sulphuric acid out doors until they Bend — then take out + run Curve — take some + dip in asphalt sol + run through whole of reg process —

Marshall

Lamp Expts

May 7 1887

T.A.E

put some reg Carbons in strong water & SO_4 sol put Current on & oxidize the surface until very black — also put in ~~Strong~~ Nitric acid do same some sets more than others & longer — then ~~heat~~ with asphalt after they have been heated & washed to get acid out object is to remove the outer scale —

Payne

Take lot Carbons & pass them through flame so they are partially oxidized heat with asphalt

Electric Lamp Expts

May 1 1880

TAE

Take reg Carbon mounted on inside part. dip in Asphalt solution 24 hours seal in Lamp + then gradually bring fil up in Vac while pump running to Carbonize asphalt surface. stopping each time to permit gas to be evacuated

Make 6 in this manner

get Curve —

Marshall

Lamp Expts May 1 1887 TAE

ascertain on a reg set up at 80
The increase of Resistance Every
hour until broken, Then
take another and put at 80
Selecting one of same Economy +
volts + increment Res equal each
time to increase on the one
burning & see what Cp will
Come to | dont burn the standard
only during test with Res —
object is to see how much
decrease in Cp is due to
increase of resistance —

Marshall

Lamp Expt. May 1 1887 TAE

Melt some Zinc ~~& plunge~~ get it red hot plunge secured fibres in it. also liq Copper molten in ~~[illegible]~~ white hot.

Run Curve also a curve after being treated with asphalt spun through rag process — Payne

---

Carbonize (1E) & plunge some filaments in aqua regia weak — Hamilton

also in Melted Sulphide Potasm

Lamp Expts -

May 1 1884

TAE

Put Lamp on pump with stop Cock under Hg — get Vac & work Lamp regular then close cock & let it burn at say 80 c p near as possible for 2 hours keeping pump running — then turn Cock & see if air has accumulated -

Marshall

Try passing current through reg filament & secured to inside part dipping in limpid Molten asphalt also sugar

Payne

Lamp Expts May 1 1887

Try prelimunizing fibres in Tar Linseed oil, Linseed Loaded with asphalt, asphalt in turpentine — Sugar Etc in Sealed glass tubes — upto 5 @ 700 fahr ~~do~~ also try Halord Combination with Carbon — Chls Carbon Etc —

Hamilton

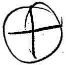
Make Couple Extra brass tubes suspend — them pine pieces. allow them to remain in Lamp heating slow 1 to 3 days ~~see if crack~~ ~~by time~~ Keep record of time & deliver to me

John Ott

⊗

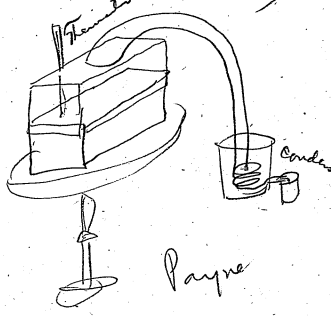
Lamp Expts May 1. 1887 Jan

Float on surface of Asphalt
&also sugar solution
baths, best Electrotypes plumbago
^ ~~also Anthracite~~, quite thick
so that when solution goes
down it will leave a
surface of plumbago — you
can do this in a small Experimental bath
that will do 75 carbons at a time
~~also dust over film~~
~~when fresh from Bath plumbago~~
~~= powdered [illegible]~~
also try ~~finest~~ Magnesic Oxide
oxide alumina Elc, this will
give good reflecting surface
make order No of 15 each kind
M Martin



Lamp Expts May 1. 1887

Have box made iron Jaz

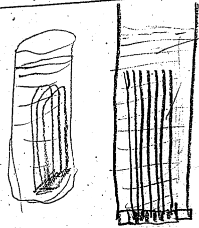

Thermometer
Condenser

Payne

put regs in forms ~~up~~ second
fill with Hg & prelimi
various speed Condensing
Hg - Sand bath

Lamp Expts. May 2 1887 Tar

Preliminary in wood tar in sealed glass tube wood tar being same nature as that from fibre I suppose a Thermometer can be sealed in tube — the end should be drawn fine so air can be let out Easy —



fibres will be kept seperated & also have a tension on them in Carbonizing

Payne

thousand and they will doubt it if acquired of them you should do likewise

Loveland

Washington

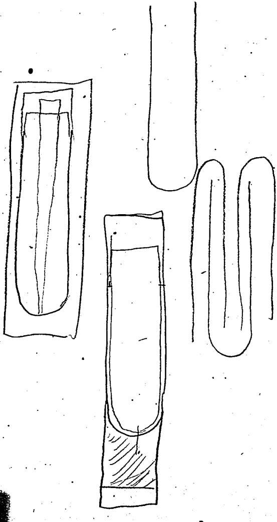
Warrington

Washington

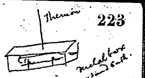
Washington

Warrington

It is probable that with wood tar in sealed tubes and 10 hours run or less that 800 degs fah can be ~~reached~~ & that there will be no more tar left in filament to make a crust on surface to cause strain & cracks. It is also doubtful if they will crack if not this will be an Evidence there is little Rupert drop action on surface.



Order Nos for Hamilton



Sealed tube - Wood Tar. Themom in 600, 8 hours reading -

ditto. quickly as possible - a bunch of ~~[illegible]~~ new stock ~~8x~~ round -- about 100 in bundle; weighted with say. Copper to hold in solution

Same as above only powdered Rosin in tube which melts.

Same as above ~~[illegible]~~ flowers sulphur

ditto. finely powdered sugar =

phenol.

" Linseed oil.

" glycerine,

" Mercury

" Linseed loaded with asphalt

powdered asphalts,

powdered Sulphide of stannum

aniline oil

9/80

acetic acid.

Saturated. Sol Sugar.

Parafine,

Iodoform.

2 pct sol of Caustic Potash

2 " Sul acid -

pure water,

Chlorine Water - Saturated.

Pentachloride phos 1 pct sol

M Force takes Hamilton order nos-

25 are dipped in 62 sugar solution & run through packing to 900 in Carbon boxes. ~~with a~~ carbon laid in anthracite 10 mesh but top of ~~pan~~ 80 mesh Cannel coal on bottom. Then given to Lawson to run through his final last not packing instead of 4½ mesh or now make equivalent to 5½ mesh to get 100 volts,

25 are to be run to 900 without dipping

25 " " put in Lawsons forms in regular manner ~~dipped~~ previously being dipped in 62 — 25 to be same

2.8 10ths to Cand

16) 450 (2.8
320
130
128
2

45 (16.

Rnd 24 -- 28 | 53 (1.9
Sqr 32
28
270
252

64

24
15
16
90
15
240

21. 6 60
32.

64
24

78
6
468
31
499

780
4
3120

16 - 4.5.
5.5

45 (160 (3.55
135
250
225
250

50 - Contact R
64 Contact Sqr -

80

28 surface 60 vol
49 Contact
Sqr

24. Round 24 - 50 Contact

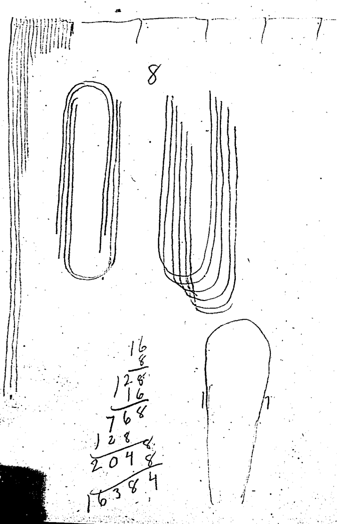
355 | 550 (15
5
355
1950
1775

Then run through pump room as many as possible of the 25. afterwards what Comes out ~~as best~~ all are to be tested for spots etc notes made about number bent & otherwise inferior & 10 of best are to be selected for Curve (10) order number.

Marshall take 30 Lamps
Regulars but with new clamps
10 are to be run up on pump in regular way ~~but not as high up not as highest~~ with exception that instead of running peg up as high as it will stand to run peg up little less than they do on regulars
The next 10 are to be run up just as high as it is possible to go without arcing or melting Clamp
The remaining 10 are to be run up as high as possible and in addition are to be allowed to burn ~~[illegible]~~ 10 minutes or so at say 100 candles.

The object of the experiment is to
Consolidate the carbon on the pumps
and prevent ~~the change~~ that
portion of the drop in candle
power due to increase of
resistance. ~~at~~ which appears
to take place in the first
2 or 3 hours at 80 candles
I think ~~that~~ bringing the
filament up much higher
than usual which with
new clamp is probably possible
+ holding the peg there
~~for~~ some time ~~that~~ the filament
will have the change taken
out of it so when it goes to
photometer room it will
get a reading which will
not change much after

you will probably find that arcing will destroy some of your lamps so you better ~~[illegible]~~ Keep ~~making~~ putting lamps in pumps until you get the requisite 10 for a curve keeping account of the number broken & how broken it took to get the 10 — you will select Reg 16 cp lamps for this ~~test~~ with the shank broken off & deposited by new process to inside wires — If you find that arcing bothers you two much you can stop it but putting about 100 ohms resistance



16
8
128
16
768
128
2048
8
16384

in circuit when you have
the peg at the highest, the
arc ~~[illegible]~~ springs
with greater difficulty —
when there is a resistance
in circuit somewhat near
that of the lamp - It is
probable that the deposit
at the clamp should be
somewhat thicker than
would be necessary with
the present way of working

As a magnet will attract
an arc I have a strong
impression that it would
be difficult to spring

an arc if one of the magnets using on pump in Laboratory were used + powerfully energized - perhaps you better use my pump for the experiments as they have magnets already on -

The great point is to bring the filament up on the pumps far higher than is now usual in fact the highest attainable limit that is practicable with the use of every device to prevent arcing -

These 3 sets of lamps should then be set up

at [illegible] 80 candles each
and the drop in candle power
taken every hour acurately
this will give us the value if
any of bringing them up
high on pumps & it may
also effect their life for
good or bad - Ed Marshall

~~Deshler~~ Howell

5 Regular lamps to be
put up at 80 candles
a reading of candle
power to be taken every
hour & the change in resistance
of the filament taken
acurately every hour

The object of the Experiment being to ascertain what proportion of the drop in candle power is due to a change in the mere resistance of the filament - by using a fresh lamp & putting in circuit a varying resistance The fall in cp from resistance can I suppose be ascertained I suppose 5 lamps will be sufficient to give a correct result,

---

Experiment No 2

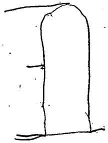
Select 5 bulbs
which have been blackened
They should be of various
shades from a slight
blackening to a very
Much blackened or 1
have Holzer carefully
remove the inside part +
broken Carbon, then Taken
from a Regular lamp
which has been ~~test~~
for Volt cp ~~+ amperes~~
the inside part + Carbon
+ seal this in the

Flockened bulb — ~~[illegible]~~ ?
tell him to be careful
not to heat the bulb
up where light comes through
as the warmed removes
some of the flockening
the have them rexhausted
& not run up very high
on pump but just enough
to get air out. Then
~~you can~~ set them up
at same volts ~~[illegible]~~ &
get cp – The object of
the experiment is to determine
what proportion of the

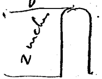
drop of Cp is due to
blacking — These
Lamps showed after you
are through testing
be mounted on a board
& the loss on each plainly
marked & kept in your
Museum for further reference
by looking at the tint
of a bulb & comparing
one can pretty accurately
determine the loss of
Cp by the blacking

which will be useful
in future Experimenting
if you dont think 5
bulbs enough select
such a number as will
give us an ~~argument~~ octave
End Howell

Martin Force -
25 fibres of each Kind &
round of the different Kinds
of stock sent me by Payne
~~including~~ Req new stock mangrove ~~bamboo~~
+ Hamilton, are to be ~~p~~ bent
round the hot bender in
packed in about 40 mesh
anthracite in Carbon boxes -
and these are to be given

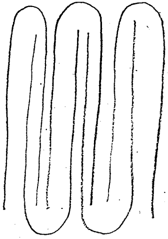


Lawson to be run through the full process after receiving them from him they are to be secured to ~~clamp~~ inside wires by deposit each filament is to be cut 2 inches long after it is fully carbonized thus



filament as it comes from Lawson

Each is to have an order number ~~allow those~~ out of those of each order number that gets through pump room select 10 for a Curve but have accounts Kept of number of filaments that are good that comes out of the Carbonizing boxes number broken in depositing ditto pump room an important Element to determine Value of a new fibre is the breakage as well as the life - These filaments are not to be treated in any manner



but just run through in
the old way this will
determine their value
independent of any
treatment, I suppose
you could string them on
your paper sieve pieces
for convenience & thus get
the 25 in two boxes,
These boxes should all
be mixed & placed in
various parts of Lawsons
~~Should~~ [illegible]

Hamilton.

You are to try the following Experiments all of which will require several weeks time & very careful manipulation otherwise they will not be of very much value, The Experiments are the bringing up bamboo filiments quickly & also gradually in liquids etc in sealed glass tubes thick enough to withstand the pressure which will ensue from a temperature of 600 deg fahr - These glass tubes should be about $\frac{1}{8}$ of inch thick & $1\frac{1}{2}$ to 2 inches in diameter

Closed at one end by fusion
like a ~~test tube~~. the other End
should be open to permit the
insertion of the filaments -
[illegible] which must be
secured in Carbon or metal
receptible so filament do not
touch sides of glass tube
& so they will not float to top
in the liquid ~~or~~ when a solid
or powdered form becomes a
liquid - Enough material
should be used to cover the
filaments entirely when the
tube is at angle of say
30 degs -

~~The end~~ after the liquid or powder etc is put in tube + everything ready ~~the end~~ it is to be taken into Gas force & sealed the end being drawn out to a point so that when the Experiment is finished the tip can be broken off to allow of ~~the~~ Escape of the gases slowly - then the tube is to be cracked at point where it has full diameter the filaments taken out and soaked in a warm Solvent of the material

used for instance if asphalt
was the material used then
The filaments can be washed in
considerable quantity of
Benzol slightly warmed on
sand bath If linseed oil
a large quantity of
Turpentine will dilute it
so that filaments when taken
out will have practically
no linseed oil on them &
the turpentine will evaporate
If sugar then water
will dissolve it — always
use a considerable quantity
of water or other solvent
to wash the filaments

a chamber should be
used which will hold
say 3 ~~tubes~~ to 6 tubes
& heated by a gas stove
or other means, a Fahr
Thermometer should enter
the chamber the bulb being
amid the tubes so it will
get same heat as they do
the Column should appear
outside the chamber when
mercury stands at 100 degrees
The Thermometer should be
capable of indicating up
to 6.00 degrees a very long
one is not necessary one about
12 inches long is sufficient

& are not so expensive -
The chamber should be arranged
so that the temperature can
be regulated very nicely
~~deg~~ so that starting at
100 fahr it will go gradually
up to 600 deg in 8 hours
also be able to go to
600 inside of one hour
as I desire to make some
experiments rapid & slow —
Should any tube Explode
the chamber will prevent
the ~~glass~~ broken glass
from coming in Contact with
the Eyes —

The carbons to be used
are regular 8 X 13½ -
with the shanks on same as
now. about 25 ~~carbons~~ filaments
should be put in Each tube
Except in the case where you
put regular forms in then
3 canbe put in each form
& 3 forms used. making
9 carbons. You can get
instructions from me as to
best method of putting
the filaments together for
placing in the tube

after washing & drying the filaments they are to be placed in the little paper boxes with the Number marked on the box & also on a slip in the box - Each ~~box slie~~ Experiment should be given a number, Thus Hamilton Experiment No1 - Variation No 6

The tube Experiments being Called No1 Experiment. & Each tube a Variation with a number —

[illegible]

There will be duplicate tubes in every Experiment one of the tube containing the same material as the other will be gradually run up in temperature from the temperature of the atmosphere to 600 degree Fahr ~~down~~ gradually during 8 hours —

While the other tube ~~contains~~ which is a duplicate will be run up to 600 degree in one hour or as near that as possible

~~you should be~~

I shall require about
~~20~~ 30 pairs of tubes
all ~~most~~ of which will be
$1\frac{1}{2}$ inches diameter inside
measurement $\frac{1}{8}$ thick —
Have Mr Holzer order it
immediately so as to have it
by time your furnace is
ready - He will obtain for you
a Thermometer anything
relating to making furnace
speak to me & I will
have made —

all of the paper boxes containing order numbers are to be delivered to me —

The following are the materials to be placed in the tubes please see if we have them all if not make list as they can be ordered immediately

No 1 - Boiled Linseed Oil —

No 2 - Pure undiluted glycerine

No 3 Mercury —

No 4 Phenol (ie) Carbolic acid

No 5 Parafine

No 6 Wood Tar

No 7 Powdered Rosin 60 mesh

There should be enough powder put in tube so that when it melts it will cover the filaments fully

No 8 - acetic acid glacial.

No 9 - 50 ~~percent~~ parts by weight of asphalt disolved in 50 parts by weight of linseed oil

No 10 powdered asphalt 60 mesh

No 11 Aniline Oil -

No 12 powdered sugar this is sold in grocery under name of pulverized sugar & is very fine —

No 13 50 parts by weight of sugar & 50 parts Water

14 pure water

15 Saturated Chlorine water

16 - 5 per cent solution of Caustic Potash in Water

17 5 per cent solution of Sulphuric acid in Water

18 - Idioform —

19 - ~~Flower~~ Flour of Sulphur

20 powdered fusible metal 10 @ 20 mesh - Formula 4 parts Bismuth 1 part Cadmium 2 parts of Lead 1 part of Tin

These are previously fused
together + then powdered
I think it is brittle if not
you can cut it up it
melts about 175 Fahr –
See that we have a supply
of material suffient to
make 4 or 5 times the
quantity needed

21 – Trichloride of Antimony

22 – Anthracene

23 powdered sulphide of Potassium

24 – 5 percent solution of Chromic
acid in Water –

25 - 5 percent solution of Nitric acid -

26 - Water 93 parts Caustic Potash 5 parts pyrogallic acid 2 parts,

27. Chloride of Lime fresh 20 parts Water 80 parts

28. Water 90 parts Hydrofluoric acid 10 parts - be very careful in handling the Hydrofluoric acid not to get any on your fingers or body it makes ulcers but after dilution with water it is not dangerous

I will probably give you other solutions in addition before the End of the Experiment

E

LF 500
700
200
SMW

45-00
36000
30000
66000